

## WHAT IS CLAIMED IS:

1. A catalytic converter assembly for use in an exhaust purification system for a diesel or other compression ignited engine to remove particulate and gaseous pollutants therefrom, said assembly comprising:

a housing defining an exhaust inlet and an exhaust outlet;

an catalytic element disposed within said housing between said inlet and said outlet such that upon communicating said inlet with the engine exhaust, the exhaust passes through said housing about said catalytic element; and

a heating assembly associated with said housing for heating the exhaust flowing through said housing between said inlet and said catalytic element to a temperature sufficient to initiate a catalytic reaction between the exhaust and said catalytic element and to incinerate particulate pollutants in the exhaust prior to said particulate pollutants contacting said catalytic element.

2. The catalytic converter assembly of claim 1 wherein said heating assembly provides one or more flames within said housing for igniting gaseous pollutants in the exhaust and raising the temperature in said housing between said inlet and said catalytic element to enhance the efficiency of said heating element.

3. The catalytic converter assembly of claim 1 wherein said catalytic element comprises pellets containing palladium.

4. The catalytic converter assembly of claim 1 wherein said heating assembly heats said exhaust to a temperature of at least about 575° F.
5. The catalytic converter assembly of claim 1 wherein said heating assembly heats said exhaust to a temperature of at least about 750° F.
6. The catalytic converter assembly of claim 1 wherein said heating assembly includes an infrared heat generating element formed of foraminous material defining a plurality of small passageways therein communicating with an interior portion of said housing between said exhaust inlet and said catalytic element, a pressurized source of fuel communicating with said interior portion of said housing through said passageways and an igniter proximate said heat generating element for igniting the fuel passing therethrough.
7. The catalytic converter assembly of claim 6 wherein said fuel comprises propane and said igniter includes a spark plug and means for activating said spark plug.
8. The catalytic converter assembly of claim 6 wherein said passageways are configured to generate infrared wave patterns.
9. The catalytic converter assembly of claim 1 wherein said housing defines a combustion chamber therein between said exhaust inlet and said catalytic element and wherein said heating assembly comprises a mixing chamber, a block of

foraminous material disposed between said mixing chamber and said combustion chamber, said foraminous material defining a plurality of passageways therein communicating said mixing chamber with said combustion chamber through said block, a fuel inlet adapted to communicate a pressurized source of fuel with said mixing chamber, an air inlet adapted to communicate a pressurized source of air with said mixing chamber, a controller for regulating the air and/or fuel flow into said mixing chamber and an igniter disposed within said housing proximate said block of foraminous material for igniting a fuel and air mixture flowing into said combustion chamber from said mixing chamber through said block whereby the temperature within said combustion chamber is heated to a temperature of at least about 575° F.

10. The catalytic converter assembly of claim 6 wherein said heating assembly heats said interior portion of said housing to a temperature of at least about 575° F.

11. The catalytic converter assembly of claim 6 wherein said heating assembly heats said interior portion of said housing to a temperature of at least about 750° F.

12. The catalytic converter assembly of claim 6 wherein said catalytic element comprises pellets containing palladium.

13. The catalytic converter assembly of claim 9 wherein said temperature in said combustion chamber is elevated by said heating assembly to at least about 750° F.

14. The catalytic converter assembly of claim 9 wherein said foraminous material is ceramic and said catalytic element comprises pellets containing palladium.

15. The catalytic converter assembly of claim 9 wherein said heater assembly provides one or more flames within said combustion assembly for igniting gaseous pollutants in the exhaust and raising the temperature in said housing between said inlet and said catalytic element to enhance the efficiency of said heating assembly.

16. The catalytic converter assembly of claim 9 wherein said controller is adapted to be operatively coupled to the engine and is responsive to changes in the operating conditions of the engine to vary the air and/or fuel flow into said mixing chamber whereby the temperature within said combustion chamber can be varied in response to said operating conditions.

17. The catalytic converter assembly of claim 9 wherein said foraminous material is ceramic.

18. The catalytic converter assembly of claim 9 wherein said passageways are configured to generate infrared wave patterns.

19. The catalytic converter assembly of claim 9 wherein said foraminous material is ceramic and said passageways are configured to generate infrared wave patterns.

20. The catalytic converter assembly of claim 10 wherein said catalytic element comprises pellets containing palladium oxide.

21. The catalytic converter assembly of claim 15 wherein said temperature in said combustion chamber is elevated by said heating assembly to at least about 750° F.

22. A catalytic converter assembly for use in an exhaust purification system for a diesel or other compression ignited engine to remove particulate and gaseous pollutants therefrom, said assembly comprising:

a housing defining an exhaust inlet and an exhaust outlet;

an oxidizing catalytic element comprised of palladium disposed within and extending across said housing between said inlet and said outlet such that upon communicating said inlet with the engine exhaust, the exhaust passes through said housing about said catalytic element; and

a heating assembly associated with said housing providing one or more flames within said housing for igniting gaseous pollutants in the exhaust between

said inlet and said catalytic element and heating the exhaust between said inlet and said catalytic element to a temperature sufficient to initiate a catalytic reaction between the exhaust and said catalytic element and to incinerate particulate pollutants in the exhaust prior to said particulate pollutants contacting said catalytic element.

23. The catalytic converter assembly of claim 22 wherein said heating assembly includes an infrared heat generating element formed of a foraminous material defining a plurality of small passageways therein communicating with an interior portion of said housing between said exhaust inlet and said catalytic element, a pressurized source of fuel communicating with said interior portion of said housing through said passageways and an igniter proximate said heat generating element for igniting the fuel passing therethrough.

24. The catalytic converter assembly of claim 22 wherein said housing defines a combustion chamber therein between said exhaust inlet and said catalytic element and wherein said heating assembly comprises a mixing chamber, a block of ceramic material disposed between said mixing chamber and said combustion chamber, said ceramic material defining a plurality of passageways therein communicating said mixing chamber with said combustion chamber through said block, a fuel inlet adapted to communicate a pressurized source of fuel with said mixing chamber, an air inlet adapted to communicate a pressurized source of air

with said mixing chamber, a controller for regulating the air and/or fuel flow into said mixing chamber and an igniter disposed within said housing proximate said ceramic block for igniting a fuel and air mixture flowing into said combustion chamber from said mixing chamber through said block whereby the temperature within said combustion chamber is heated to a temperature of at least about 575° F.

25. The catalytic converter assembly of claim 22 wherein said igniter includes a spark plug and means for activating said spark plug.

26. The catalytic converter assembly of claim 23 wherein said fuel comprises propane and said igniter includes a spark plug and means for activating said spark plug.

27. The catalytic converter assembly of claim 23 wherein said foraminous material is ceramic.

28. The catalytic converter assembly of claim 24 wherein said temperature in said combustion chamber is elevated by said heating assembly to at least about 750° F.

29. The catalytic converter assembly of claim 24 wherein said controller is adapted to be operatively coupled to the engine and is responsive to changes in the operating conditions of the engine to vary the air and/or fuel flow

into said mixing chamber whereby the temperature within said combustion chamber can be varied in response to said operating conditions.

30. An exhaust purification system for use with a diesel or other compression ignited engine to remove particulate and gaseous pollutants from the exhaust thereof, said system comprising:

a catalytic converter assembly including a housing defining an exhaust inlet and an exhaust outlet, an oxidizing catalytic element disposed within said housing between said inlet and said outlet such that upon communicating said inlet with the engine exhaust, the exhaust passes through said housing about said catalytic element and outwardly therefrom through said exhaust outlet, a heating assembly associated with said housing for heating the exhaust flowing through said housing between said inlet and said catalytic element to a temperature sufficient to initiate a catalytic reaction between the exhaust and said catalytic element and to incinerate particulate pollutants in the exhaust prior to said particulate pollutants contacting said catalytic element;

a first conduit;

a plurality of gas cooling elements communicating with the exhaust outlet in said housing of said catalytic converter assembly via said first conduit, said elements reducing the temperature of the exhaust passing from said exhaust outlet in said catalytic converter assembly to about 100° F; and



a second conduit communicating with said gas cooling elements and directing the cooled exhaust from said cooling elements back to the engine for combustion therein.

31. The exhaust purification system of claim 30 including a valve assembly communicating with said second conduit for injecting a calculated volume of air into said second conduit whereby the oxygen level in the exhaust passing through said second conduit to the engine is elevated, and a regulator operatively connected to said valve assembly for controlling the volume of injected air.

32. The exhaust purification system of claim 30 wherein one or more of said gas cooling devices causes the exhaust passing therethrough to expand to effect cooling of the exhaust and condensation of water vapor therein and including a collector for condensed water vapor and a conduit for directing the condensed water vapor from said system.

33. The exhaust purification system of claim 30 wherein said heating assembly provides one or more flames within said housing for igniting gaseous pollutants in the exhaust and raising the temperature in said housing between said inlet and said catalytic element to enhance the efficiency of said heating element.

34. The exhaust purification system of claim 30 wherein said oxidizing catalytic element comprises pellets containing palladium.

35. The exhaust purification system of claim 30 wherein said heating assembly includes an infrared heat generating element formed of a foraminous material defining a plurality of small passageways therein communicating with an interior portion of said housing between said exhaust inlet and said catalytic element, a pressurized source of fuel communicating with said interior portion of said housing through said passageways and an igniter proximate said heat generating element for igniting the fuel passing therethrough.

36. The exhaust purification system of claim 30 wherein said igniter includes a spark plug and means for activating said spark plug.

37. The exhaust purification system of claim 30 wherein said fuel comprises propane and said igniter includes a spark plug and means for activating said spark plug.

38. The exhaust purification system of claim 30 wherein said foraminous material is ceramic.

39. The exhaust purification system of claim 33 wherein said oxidizing catalytic element comprises a bed of pellets containing palladium.

40. The exhaust purification system of claim 35 wherein said oxidizing catalytic element comprises a bed of pellets containing palladium.

41. An exhaust purification system for use with a diesel or other compression ignited engine to remove particulate and gaseous pollutants from the exhaust thereof, said system comprising:

a catalytic converter assembly including a housing defining an exhaust inlet and an exhaust outlet, an oxidizing catalytic element disposed within said housing between said inlet and said outlet such that upon communicating said inlet with the engine exhaust, the exhaust passes through said housing about said catalytic element and outwardly therefrom through said exhaust outlet, a heating assembly associated with said housing for heating the exhaust flowing through said housing between said inlet and said catalytic element to a temperature sufficient to initiate a catalytic reaction between the exhaust and said catalytic element and to incinerate particulate pollutants in the exhaust prior to said particulate pollutants contacting said catalytic element;

a first gas cooling element communicating with the exhaust outlet in said housing of said catalytic converter assembly for reducing the temperature of the exhaust passing therethrough;

a second cooling element communicating with said first element for further cooling the exhaust passing from said exhaust outlet in said catalytic converter assembly;

a third cooling element communicating with said second cooling element for further cooling the exhaust passing therethrough;

a filter element disposed between and communicating with two of said cooling elements for removing gaseous and particulate pollutants from the exhaust; and

a conduit communicating one of said cooling or filtering elements and directing the cooled and filtered exhaust back to the engine for combustion therein.

42. The exhaust purification system of claim 41 including a valve assembly communicating with said conduit for injecting a calculated volume of air into said conduit whereby the oxygen level in the exhaust passing through said conduit to the engine is elevated, and a regulator operatively connected to said valve assembly for controlling the volume of injected air.

43. The exhaust purification system of claim 41 wherein one or more of said cooling elements causes the exhaust passing therethrough to expand to effect cooling of the exhaust and condensation of water vapor therein and including a collector for condensed water vapor and a conduit for directing the condensed water vapor from said system.

44. The exhaust purification system of claim 41 wherein said heating assembly provides one or more flames within said housing for igniting gaseous pollutants in the exhaust and raising the temperature in said housing between said inlet and said catalytic element to enhance the efficiency of said heating element.

45. The exhaust purification system of claim 41 wherein said oxidizing catalytic element comprises pellets containing palladium.

46. The exhaust purification system of claim 41 wherein said heating element heats said exhaust to a temperature of at least about 575° F.

47. The exhaust purification system of claim 41 wherein said heating element heats said exhaust to a temperature of at least about 750° F.

48. The exhaust purification system of claim 41 wherein said first cooling element comprises an elongated metal tubular member defining a plurality of coils therein.

49. The exhaust purification system of claim 41 wherein said heating assembly includes an infrared heat generating element formed of a foraminous material defining a plurality of small passageways therein communicating with an interior portion of said housing between said exhaust inlet and said catalytic element, a pressurized source of fuel communicating with said interior portion of said housing through said passageways and an igniter proximate said heat generating element for igniting the fuel passing therethrough.

50. The exhaust purification system of claim 41 wherein said igniter includes a spark plug and means for activating said spark plug.

51. The exhaust purification system of claim 44 wherein said oxidizing catalytic element comprises pellets containing palladium.

52. The exhaust purification system of claim 48 wherein said second cooling element comprises a housing having an inlet and an outlet and containing a supply of cooling liquid therein, said tubular member extending through said inlet and into said cooling liquid and wherein said outlet communicates with said third cooling element.

53. The exhaust purification system of claim 49 wherein said heating element heats said exhaust to a temperature of at least about 575° F.

54. The exhaust purification system of claim 49 wherein said heating element heats said exhaust to a temperature of at least about 750° F.

55. The exhaust purification system of claim 49 wherein said foraminous material is ceramic.

56. The exhaust purification system of claim 49 wherein said passageways are configured to generate infrared wave patterns.

57. The exhaust purification system of claim 52 wherein said tubular member of said first cooling element defines an extended end disposed within the liquid in said second cooling element and a plurality of apertures therein proximate said end for dissipating the exhaust flowing therethrough into said cooling liquid

and wherein said inlet of said housing is in sealing engagement with said tubular member.